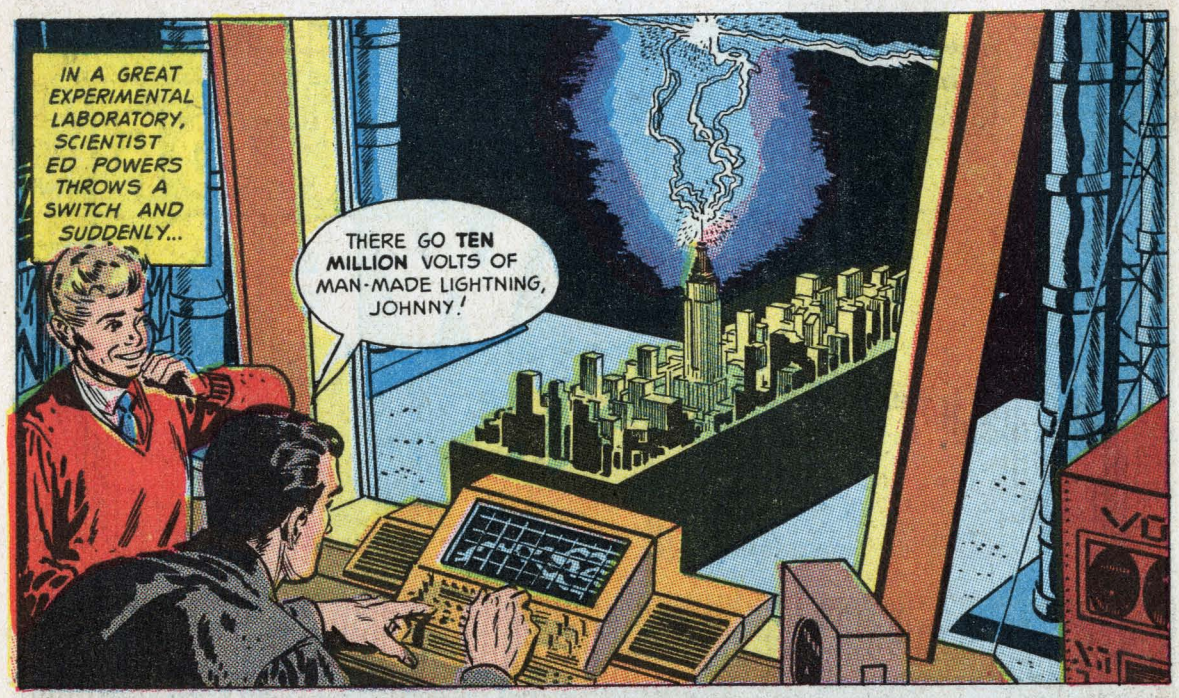
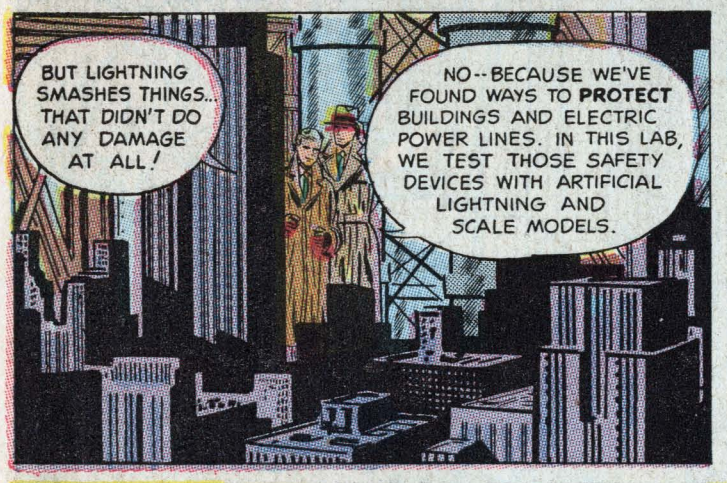
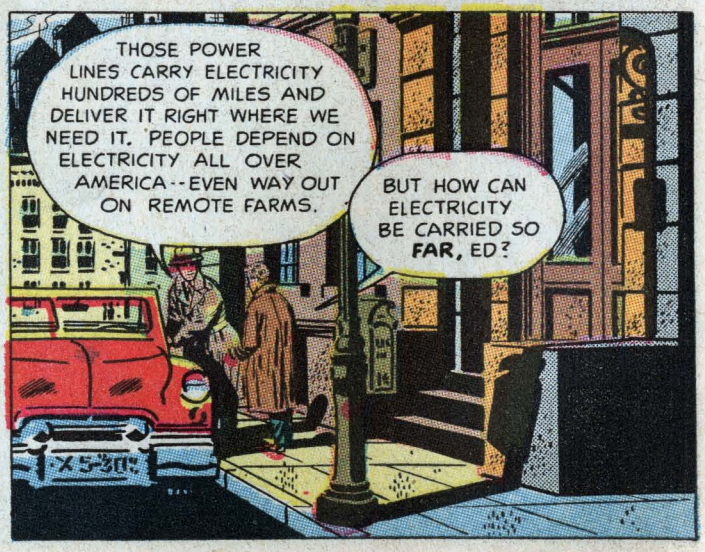
NETWORK OF POWER
ACROSS ALL AMERICA SPREAD THE GREAT TRANSMISSION AND DISTRIBUTION SYSTEMS WHICH CARRY ELECTRICITY TO FACTORIES AND HOMES, STORES AND SCHOOLS, CITIES AND FARMS. SPANNING WIDE RIVERS, DEEP CHASMS, BROAD PRAIRIES AND TOWERING MOUNTAINS, ELECTRIC POWER LEAPS TO YOUR SERVICE IN A FRACTION OF A SECOND AS YOU FLIP A SWITCH OR PRESS A BUTTON.
HERE IS THE STORY OF
THE DISTRIBUTION OF ELECTRICITY
ADVENTURES IN SCIENCE SERIES
GENERAL ELECTRIC







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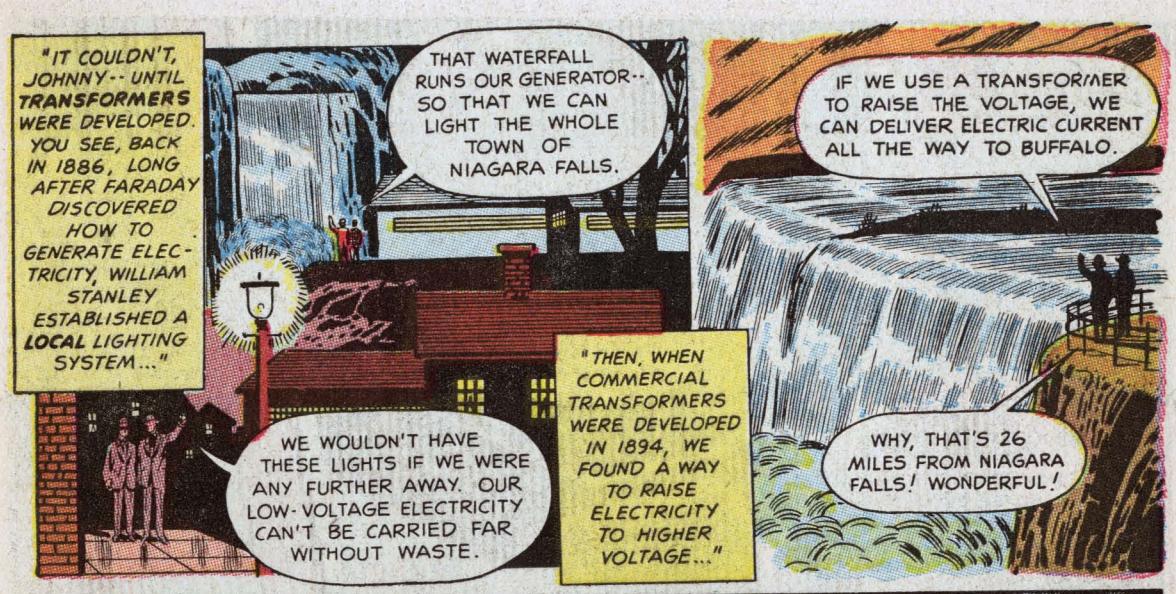
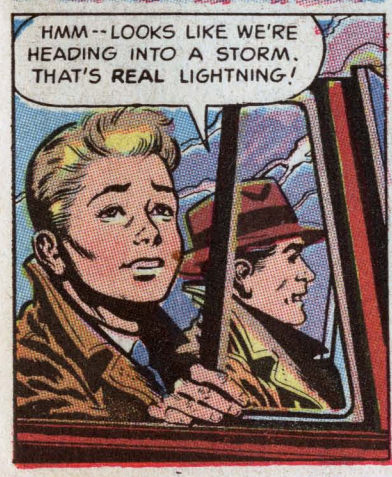
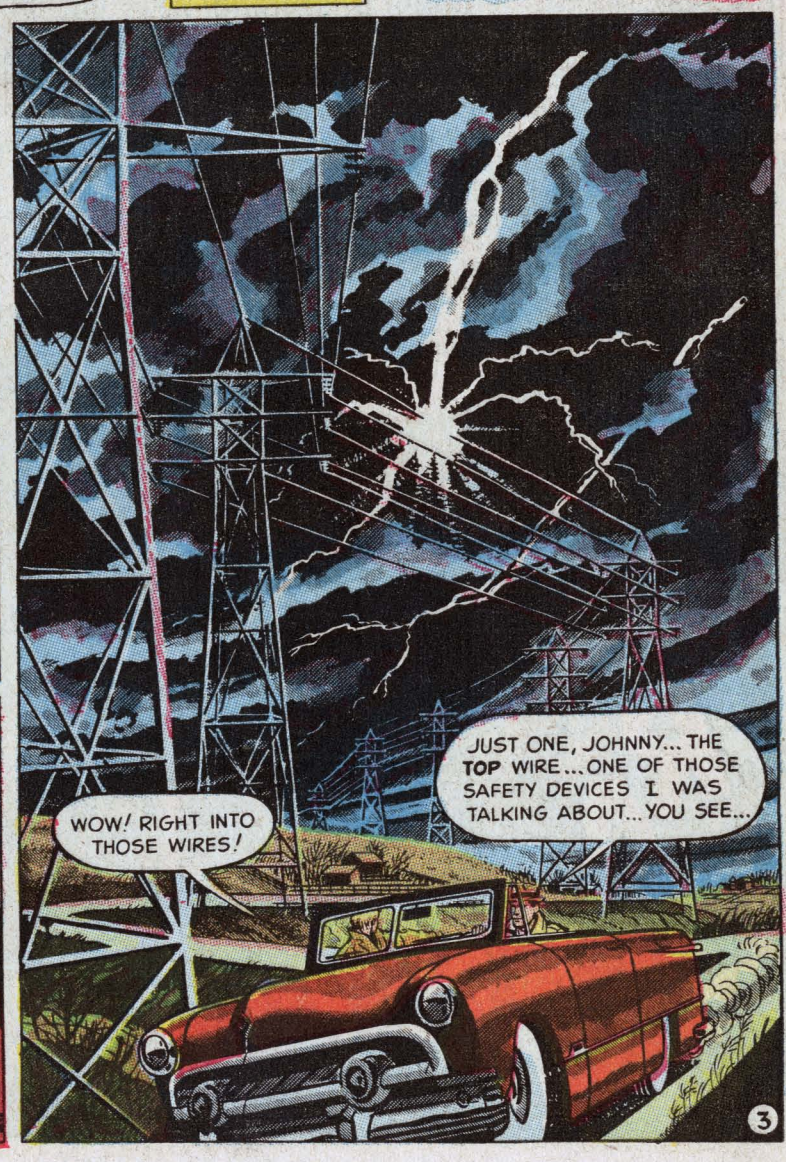

"IT COULDN'T, JOHNNY-- UNTIL TRANSFORMERS WERE DEVELOPED. YOU SEE, BACK IN 1886, LONG AFTER FARADAY DISCOVERED HOW TO GENERATE ELECTRICITY, WILLIAM STANLEY ESTABLISHED A LOCAL LIGHTING SYSTEM..."
THAT WATERFALL RUNS OUR GENERATOR-- SO THAT WE CAN LIGHT THE WHOLE TOWN OF NIAGARA FALLS.
WE WOULDN'T HAVE THESE LIGHTS IF WE WERE ANY FURTHER AWAY. OUR LOW-VOLTAGE ELECTRICITY CAN'T BE CARRIED FAR WITHOUT WASTE.
"THEN, WHEN COMMERCIAL TRANSFORMERS WERE DEVELOPED IN 1894, WE FOUND A WAY TO RAISE ELECTRICITY TO HIGHER VOLTAGE..."
IF WE USE A TRANSFORMER TO RAISE THE VOLTAGE, WE CAN DELIVER ELECTRIC CURRENT ALL THE WAY TO BUFFALO.
WHY, THAT'S 26 MILES FROM NIAGARA FALLS! WONDERFUL!

THAT WAS THE FIRST "LONG-DISTANCE" COMMERCIAL POWER LINE. NOW THEY COVER THE COUNTRY... MANY OF THEM HUNDREDS OF MILES LONG.
LOOK-- THERE'S ONE UP AHEAD OF US!

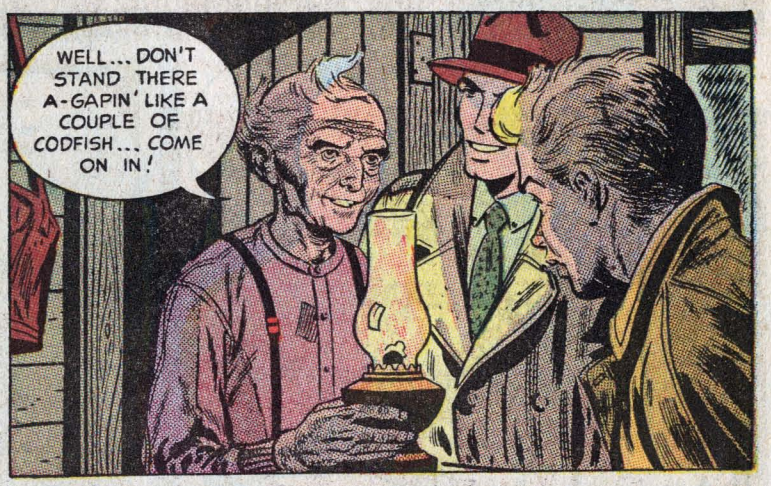

HMM--LOOKS LIKE WE'RE HEADING INTO A STORM. THAT'S REAL LIGHTNING!

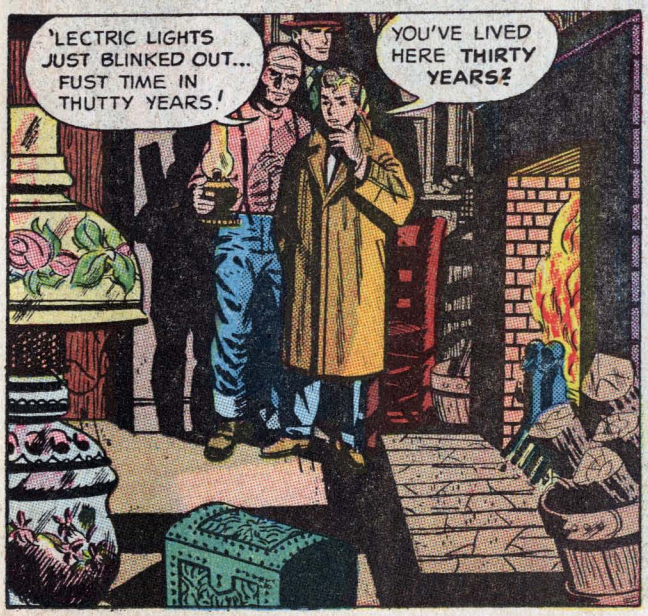

WOW! RIGHT INTO THOSE WIRES!
JUST ONE, JOHNNY... THE TOP WIRE... ONE OF THOSE SAFETY DEVICES I WAS TALKING ABOUT... YOU SEE...

IN THE NEXT FEW MOMENTS, THE GALE HOWLS WITH GREATER FURY AND SUDDENLY...

WHAT A DOWNPOUR! HOPE THESE FOLKS WON'T MIND A COUPLE OF UNINVITED GUESTS.

I HEAR SOMEONE COMING, ED!


WELL... DON'T STAND THERE A-GAPIN' LIKE A COUPLE OF CODFISH... COME ON IN!


'LECTRIC LIGHTS JUST BLINKED OUT... FUST TIME IN THUTTY YEARS!
YOU'VE LIVED HERE THIRTY YEARS?

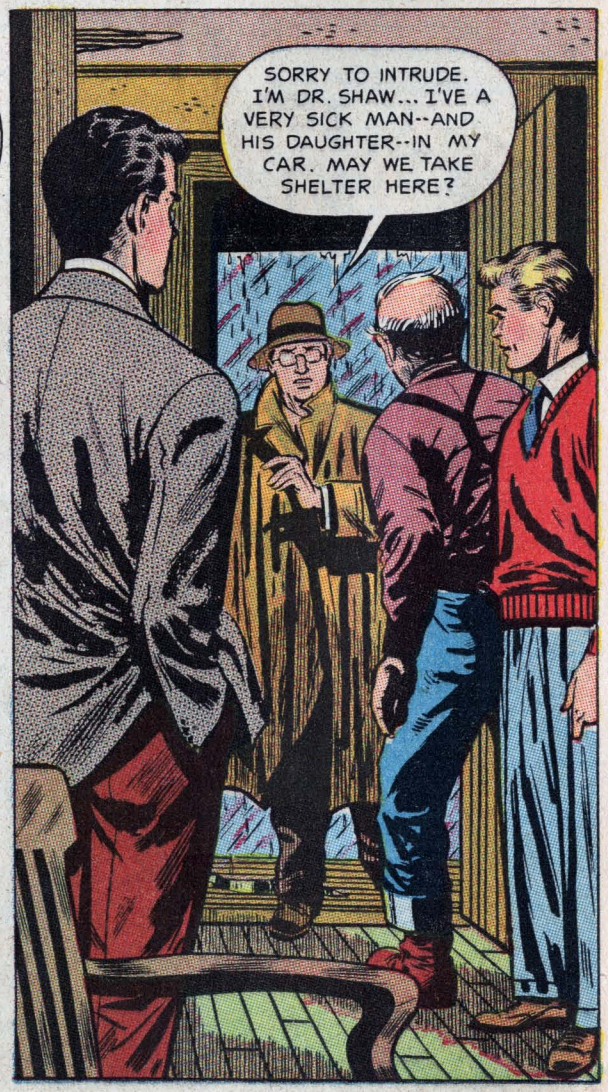
NIGH ON SEVENTY! I WAS BORN HERE!
G-GOSH, IT'S LIKE ANCIENT HISTORY--I MEAN, THAT IS... SEVENTY YEARS IS A L-LONG T-TIME!

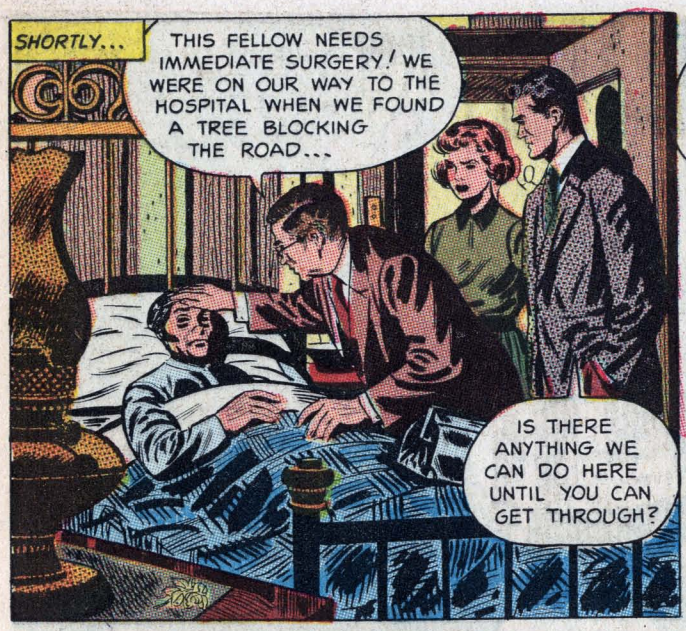
Y'KNOW, ED, IT'S KIND OF SPOOKY IN HERE -- DARK... 'N COLD... 'N QUIET! COULDN'T WE TURN ON THE LIGHTS... AND THE RADIO... AND THAT ELECTRIC HEATER OVER THERE?
WE COULD -- BUT THEY WON'T DO US MUCH GOOD WITHOUT ELECTRICITY!

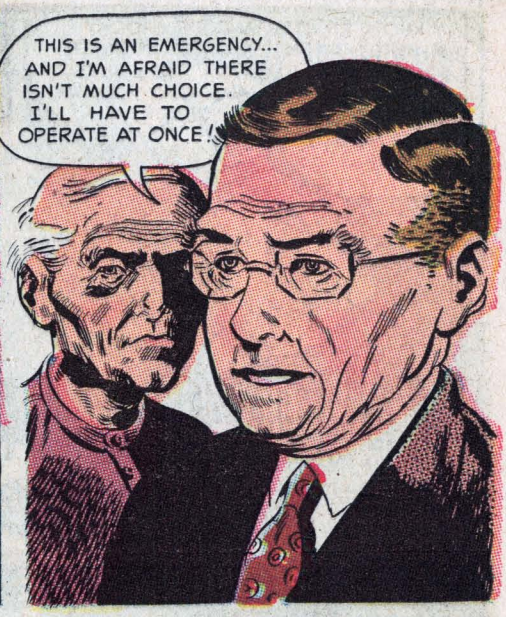
I FORGOT... I'M SO USED TO JUST TOUCHING A SWITCH, AND GETTING LIGHT, AND HEAT, AND A GOOD PROGRAM...
YOU'RE SPOILED, YOUNG FELLER!

NO, HE'S JUST USED TO THE CONVENIENCE OF ELECTRICITY... NOTHING WRONG WITH THAT!

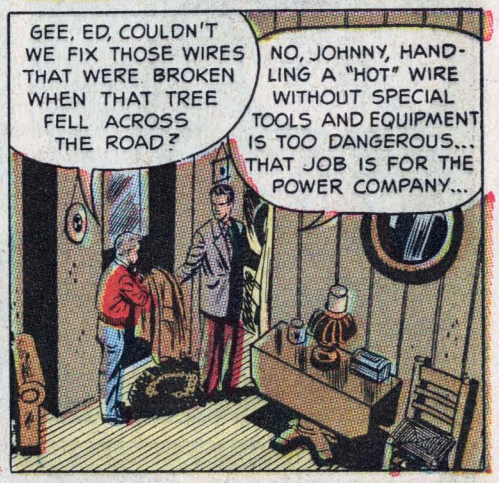
SOMEBODY ELSE CAUGHT IN THE STORM!
KNOCK
KNOCK
SOUNDS LIKE THEY'RE IN A MIGHTY BIG HURRY, TOO!


SORRY TO INTRUDE. I'M DR. SHAW... I'VE A VERY SICK MAN--AND HIS DAUGHTER--IN MY CAR. MAY WE TAKE SHELTER HERE?


SHORTLY...
THIS FELLOW NEEDS IMMEDIATE SURGERY! WE WERE ON OUR WAY TO THE HOSPITAL WHEN WE FOUND A TREE BLOCKING THE ROAD...
IS THERE ANYTHING WE CAN DO HERE UNTIL YOU CAN GET THROUGH?


THIS IS AN EMERGENCY... AND I'M AFRAID THERE ISN'T MUCH CHOICE. I'LL HAVE TO OPERATE AT ONCE!

IT'S PRETTY RISKY UNDER THESE CIRCUMSTANCES... THE LIGHT IS SO POOR, AND--
THERE MUST BE SOMETHING I CAN DO ABOUT THAT. LET'S SEE...

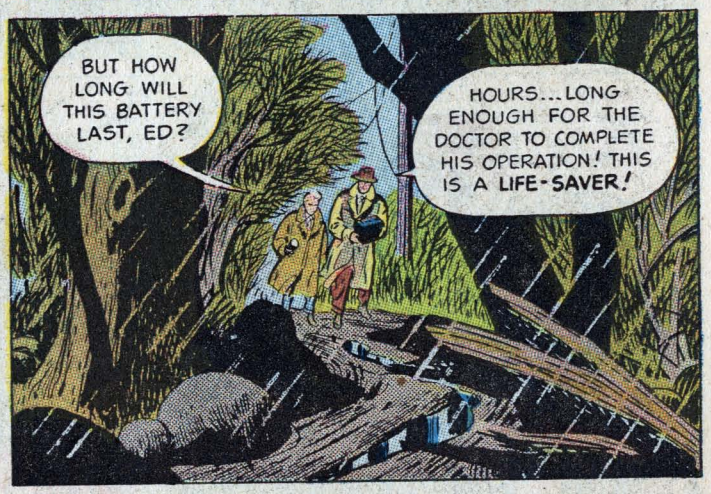

GEE, ED, COULDN'T WE FIX THOSE WIRES THAT WERE BROKEN WHEN THAT TREE FELL ACROSS THE ROAD?
NO, JOHNNY, HANDLING A "HOT" WIRE WITHOUT SPECIAL TOOLS AND EQUIPMENT IS TOO DANGEROUS... THAT JOB IS FOR THE POWER COMPANY...

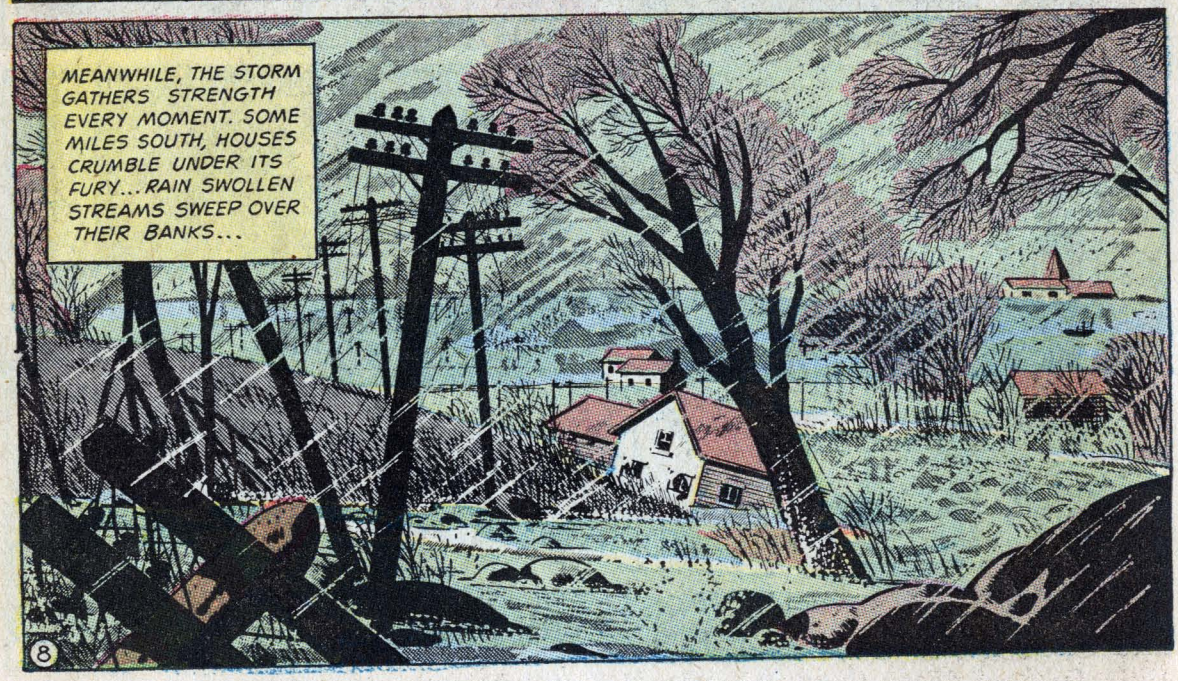
...AND THEY'LL HAVE A REPAIR CREW HERE IN NO TIME. BUT I'VE GOT AN IDEA IN THE MEANTIME! C'MON, JOHNNY!

WE'LL BE BACK WITH AN ELECTRIC LIGHT FOR YOU BY THE TIME YOU'VE GOT YOUR PATIENT READY, DOCTOR!

HERE'S WHERE WE MAKE REAL USE OF THAT SPOTLIGHT YOU TALKED ME INTO BUYING...
AH! I THINK I KNOW WHAT YOU'RE UP TO!

HERE'S THE SPOTLIGHT... NOW TO GET THE BATTERY!

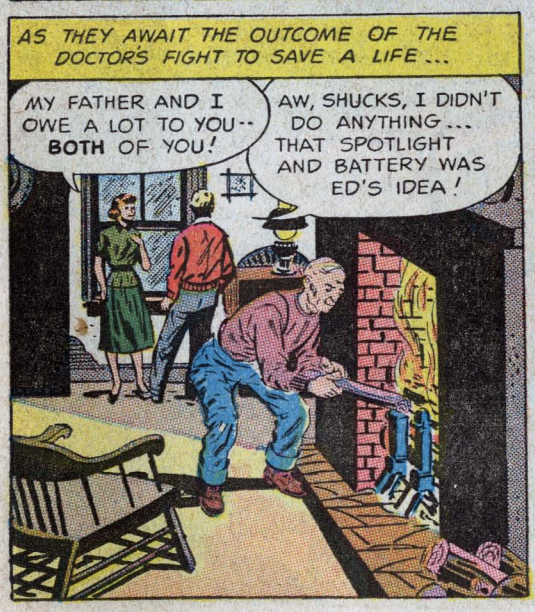

BUT HOW LONG WILL THIS BATTERY LAST, ED?
HOURS... LONG ENOUGH FOR THE DOCTOR TO COMPLETE HIS OPERATION! THIS IS A LIFE-SAVER!


MEANWHILE, THE STORM GATHERS STRENGTH EVERY MOMENT. SOME MILES SOUTH, HOUSES CRUMBLE UNDER ITS FURY... RAIN SWOLLEN STREAMS SWEEP OVER THEIR BANKS...

DEPRIVED OF ELECTRICITY, THE ACTIVITY OF A SMALL TOWN ALMOST STOPS.
NOW PLAYING
LIGHTS
EDISON LIGHT AND POWER CO.
ANN'S
JAN & HARRY
BOOK SHOP
EVEN THE FACTORY HAS STOPPED! THIS IS A GHOSTLY OLD TOWN WITHOUT ELECTRICITY!
ANY PLACE IS, BUD, WE COULDN'T GET ALONG WITHOUT IT!

UNAWARE OF THE WIDESPREAD DEVASTATION THE STORM IS CAUSING, ED AND JOHNNY CONTINUE THEIR RACE AGAINST TIME...
THERE... THAT WILL DO UNTIL THE POWER GOES ON.
GOLLY! IT WORKS!

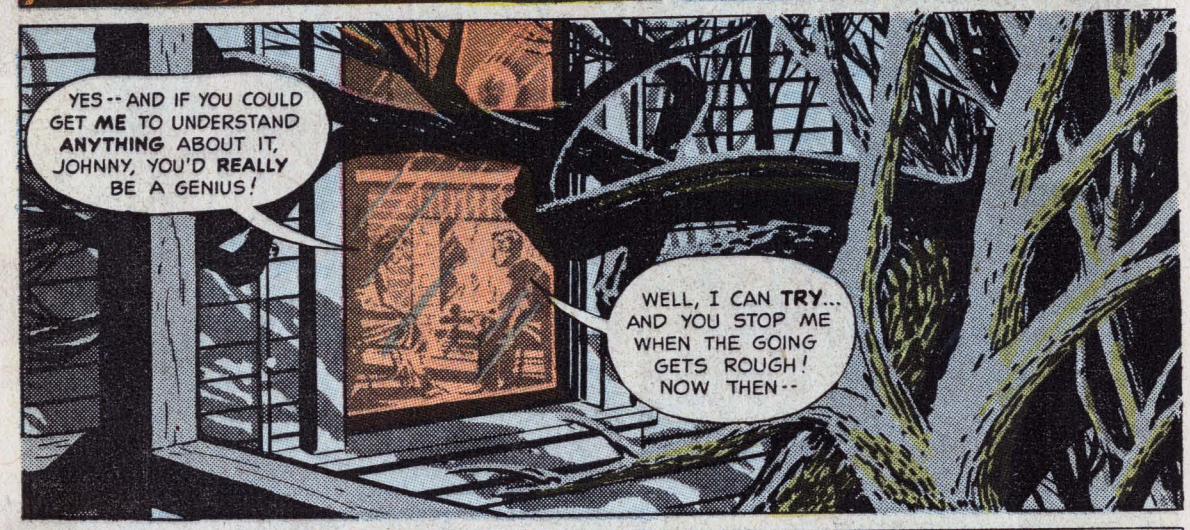
GOOD! I CAN START NOW-- BUT I'LL NEED SOME HELP. MR. POWERS, WOULD YOU MIND?

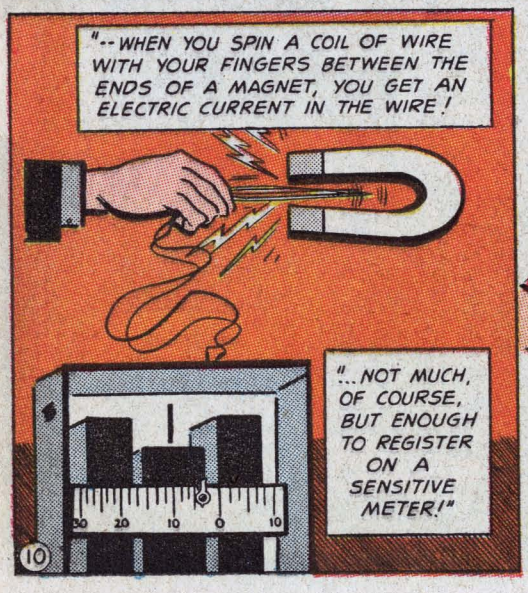

AS THEY AWAIT THE OUTCOME OF THE DOCTOR'S FIGHT TO SAVE A LIFE...
MY FATHER AND I OWE A LOT TO YOU-- BOTH OF YOU!
AW, SHUCKS, I DIDN'T DO ANYTHING... THAT SPOTLIGHT AND BATTERY WAS ED'S IDEA!

BUT YOU HELPED! WHY, I DON'T KNOW WHAT DR. SHAW WOULD HAVE DONE WITHOUT YOU TWO!
AW, THERE WAS NOTHING TO RIGGING IT UP. GLAD WE WERE ABLE TO "THROW A LITTLE LIGHT ON THE SUBJECT!"

DR. SHAW SAID HE'LL NEED LOTS OF ICE-PACKS AFTER THE OPERATION BUT THE REFRIGERATOR'S CUT OFF, TOO, AND--
BY THAT TIME, I'M SURE THE POWER COMPANY'S MEN WILL HAVE THE REGULAR HOUSE CURRENT GOING AGAIN.

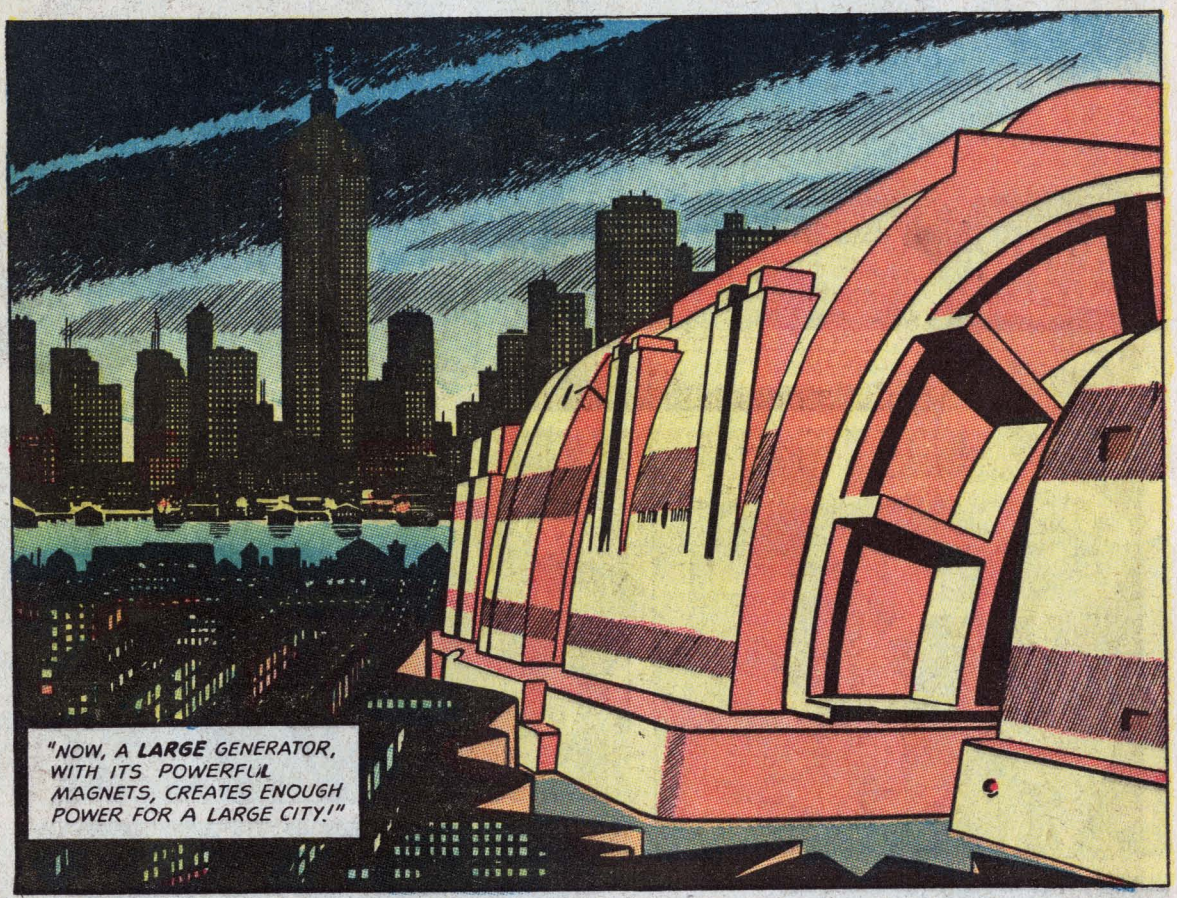
APPEARS TO ME YOU KNOW A WHALE OF A LOT ABOUT ELECTRICITY FOR SUCH A YOUNG FELLER! ER--DON'CHA THINK SO, MISS?


YES--AND IF YOU COULD GET **ME** TO UNDERSTAND **ANYTHING** ABOUT IT, JOHNNY, YOU'D **REALLY** BE A GENIUS!
WELL, I CAN **TRY**... AND YOU STOP ME WHEN THE GOING GETS ROUGH! NOW THEN--


"--WHEN YOU SPIN A COIL OF WIRE WITH YOUR FINGERS BETWEEN THE ENDS OF A MAGNET, YOU GET AN ELECTRIC CURRENT IN THE WIRE!
"...NOT MUCH, OF COURSE, BUT ENOUGH TO REGISTER ON A SENSITIVE METER!"
30 20 10 0 10

"YOU SEE, IN THE WIRE ARE BILLIONS OF TINY ELECTRONS WHICH ARE ALWAYS QUIETLY SHIFTING AROUND"
GEE, IT'S PEACEFUL HERE.

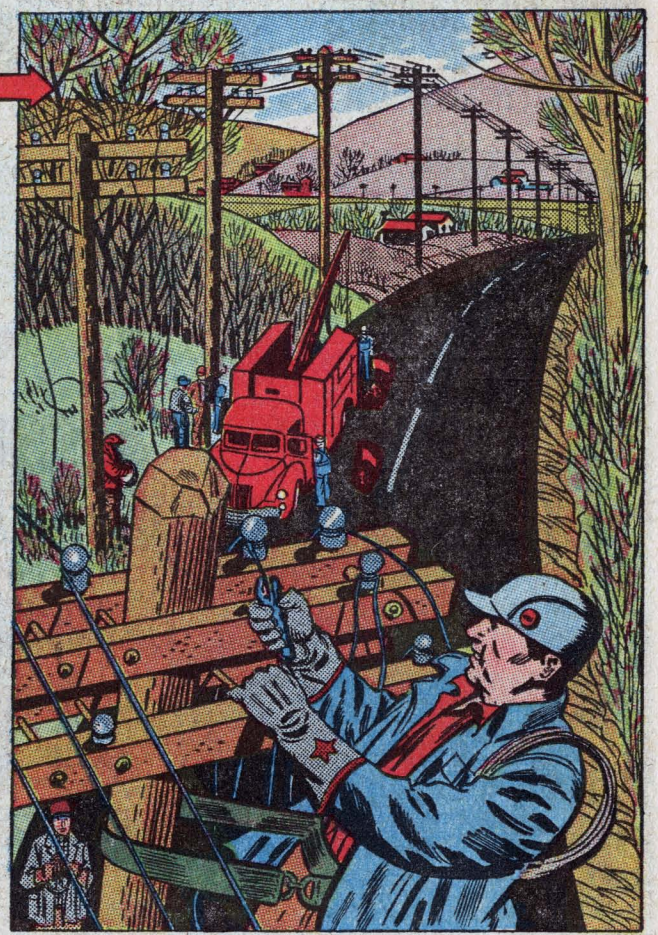
"...BUT WHEN THEY'RE MOVED NEAR A MAGNET, IT 'EXCITES' THEM--SENDS THEM RUSHING IN ONE DIRECTION THROUGH THE WIRE. THAT'S WHAT MAKES AN ELECTRIC CURRENT IN THE WIRE."


"NOW, A LARGE GENERATOR, WITH ITS POWERFUL MAGNETS, CREATES ENOUGH POWER FOR A LARGE CITY!"

IT'S AS SIMPLE AS ALL THAT!
AND I DIDN'T HAVE TO STOP YOU ONCE--GENIUS!

SUDDENLY...
OH... AT LAST!
THE OPERATION IS OVER... AND A SUCCESS! ALL WE NEED NOW IS THE REGULAR HOUSE CURRENT TO MAKE ICE IN THE REFRIGERAT

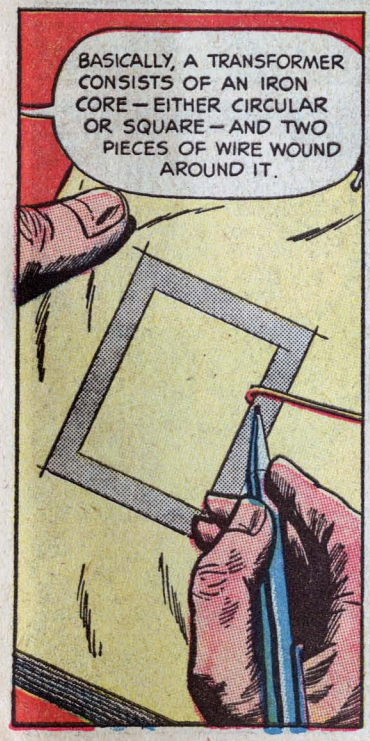
THE POWER COMPANY'S CREWMEN ARE ON THE JOB... REPAIRING THE BROKEN WIRES...

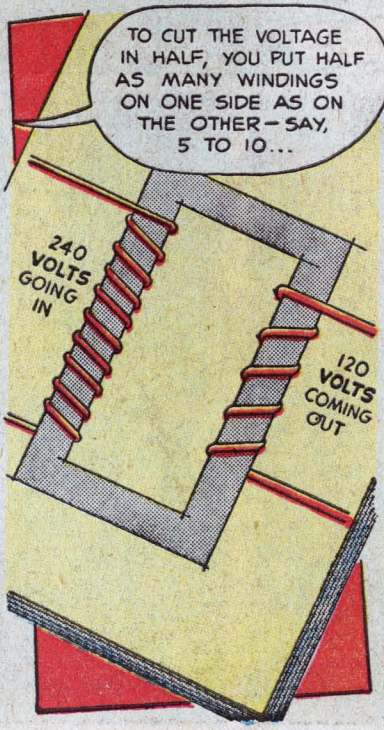


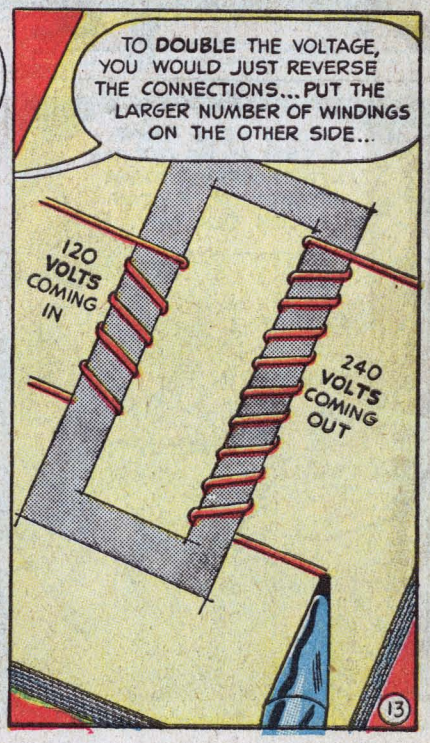
RIGHT! THAT TRANSFORMER DOWN THERE, FOR INSTANCE, CHANGES THE VOLTAGE FROM 2400 TO 240 OR 120 VOLTS FOR HOUSEHOLD USE.

GEE, THAT SOUNDS SO COMPLICATED!

IT'S NOT REALLY... LOOK... I'LL SHOW YOU. I'LL MAKE A SKETCH OF A SIMPLE TRANSFORMER.







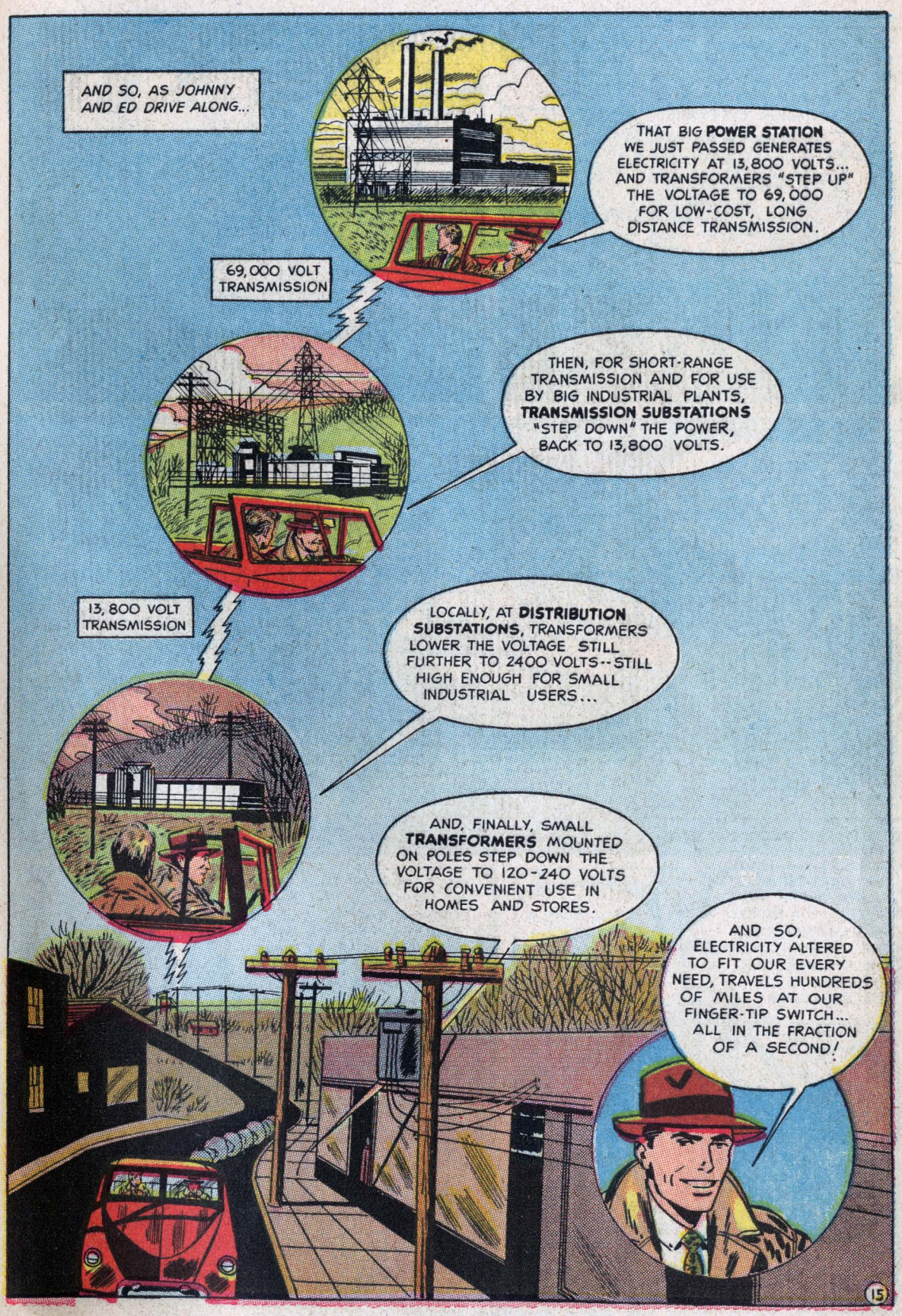
THEN, TO INCREASE THE PRESSURE TEN TIMES, YOU'D...
JUST PUT TEN TIMES AS MANY WINDINGS ON ONE SIDE AS THE OTHER—SAY 200 TO 20! I GET IT!

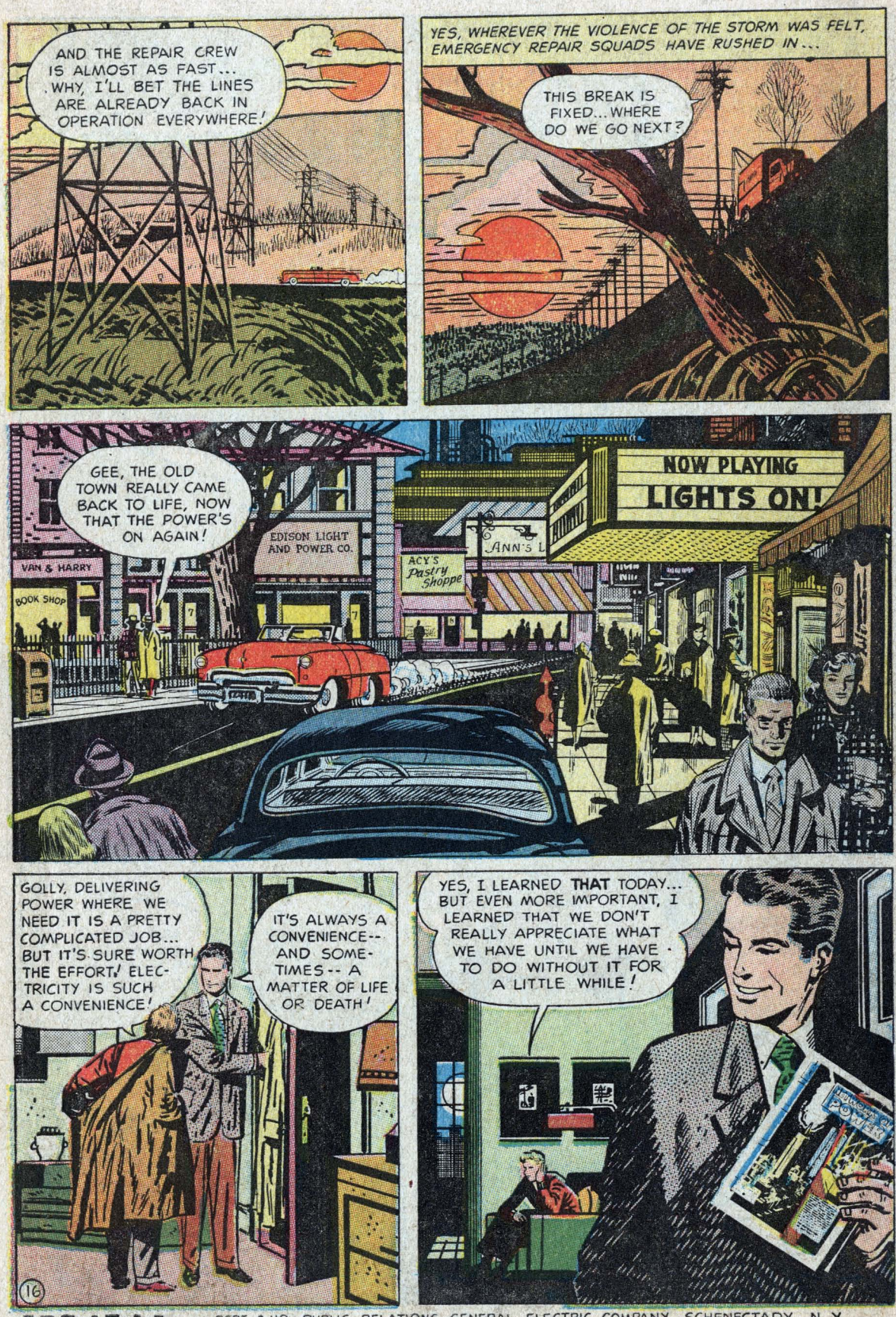
LOOK! THE LIGHTS ARE ON!
GOOD... NOW THE PATIENT CAN HAVE ICE PACKS AS LONG AS THEY'RE NEEDED.

HMM...SORRY TO INTERRUPT THE BEGINNING OF A BEAUTIFUL FRIENDSHIP, JOHNNY, BUT THE HIGHWAY PATROL IS CLEARING THE ROAD.
THANKS SO MUCH FOR YOUR HELP!
BY CRACKY, THE PLACE WILL BE LONELY WITHOUT YE!

THIS IS GOOD TIMING. AS SOON AS WE GET THE BATTERY AND SPOTLIGHT HOOKED UP, WE CAN BE ON OUR WAY.

ED, YOU PROMISED THAT ON THE WAY HOME, YOU'D SHOW ME **HOW** ELECTRICITY GETS FROM THE GENERATING STATION TO OUR HOUSE. HOW ABOUT IT?


AND SO, AS JOHNNY AND ED DRIVE ALONG...
THAT BIG POWER STATION WE JUST PASSED GENERATES ELECTRICITY AT 13,800 VOLTS... AND TRANSFORMERS "STEP UP" THE VOLTAGE TO 69,000 FOR LOW-COST, LONG DISTANCE TRANSMISSION.
69,000 VOLT TRANSMISSION
THEN, FOR SHORT-RANGE TRANSMISSION AND FOR USE BY BIG INDUSTRIAL PLANTS, TRANSMISSION SUBSTATIONS "STEP DOWN" THE POWER, BACK TO 13,800 VOLTS.
13,800 VOLT TRANSMISSION
LOCALLY, AT DISTRIBUTION SUBSTATIONS, TRANSFORMERS LOWER THE VOLTAGE STILL FURTHER TO 2400 VOLTS--STILL HIGH ENOUGH FOR SMALL INDUSTRIAL USERS...
AND, FINALLY, SMALL TRANSFORMERS MOUNTED ON POLES STEP DOWN THE VOLTAGE TO 120-240 VOLTS FOR CONVENIENT USE IN HOMES AND STORES.
AND SO, ELECTRICITY ALTERED TO FIT OUR EVERY NEED, TRAVELS HUNDREDS OF MILES AT OUR FINGER-TIP SWITCH... ALL IN THE FRACTION OF A SECOND!



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